In the Claims:

1-10. Canceled

11. (Currently Amended) An s-mmw imaging system, comprising

a non-rotating diffuser destroying a spatial coherence of radiation incident on the diffuser and directing the radiation towards a field of view, wherein the diffuser comprises a spatially distributed diffuser and wherein the diffuser comprises a plurality of spatially distributed point scatterers;

at least one radiation source disposed to illuminate the diffuser, the at least one radiation source generating radiation having a wavelength between about 0.1mm and about 10mm;

a quasi-optical element disposed between the field of view and a multi-element receiver, the quasi-optical element directly radiation from the field of view toward an imaging plane; ~~and~~

~~a~~ said multi-element receiver disposed in the imaging plane, wherein particular ones of the receiver elements transform radiation into a set of electrical signals; and

a processor coupled to receive the electrical signals from the receiver, the processor causing the point scatterers to be controlled based on information determined from the electrical signals.

12. (Currently Amended) The system of claim ~~11~~ 100 wherein the diffuser comprises a spatially distributed diffuser.

13. (Original) The system of claim 12 wherein the diffuser comprises a plurality of spatially distributed point scatterers.

14. (Currently Amended) The system of claim ~~13~~ 11 wherein the diffuser comprises a two-dimensional array of point scatterers, each of the point scatterers having a position and orientation which can be independently changed in time relative to a reference plane.

15. (Currently Amended) The system of claim ~~13~~ <u>11</u> wherein the point scatterers comprise conductive structures being loaded by impedances.

16. (Original) The system of claim 13 and further comprising a processor coupled to receive the electrical signals from the receiver, the processor causing the point scatterers to be controlled based on information determined from the electrical signals.

17. (Original) The system of claim 11 and further comprising a processor coupled to receive the electrical signals from the receiver, the processor generating resultant images from the electrical signals.

18. (Original) The system of claim 11 wherein the radiation directed from the diffuser toward the field of view comprises a set of multiple phase-independent partials being independently controllable and exhibiting distinct physical features and wherein the electrical signals include information relating to features of the partials.

19. (Original) The system of claim 11 wherein the radiation incident on the diffuser includes doublet spectral components.

20. (Original) The system of claim 19 wherein the radiation incident on the diffuser is modulated by modulating a spectral shift between doublet spectral components.

21-43 Canceled

44. (Currently Amended) A source of partially coherent radiation for illuminating a field of view, the source comprising:

at least one non-movable diffuser destroying a spatial coherence of radiation being incident on the diffuser and directing the radiation towards a field of view, the diffuser including an array of independently controllable radiation scatterers; and

at least one radiation emitting source being arranged to illuminate said diffuser with radiation;

wherein each radiation scatterer comprises a static high-Q resonant scatterer exhibiting frequency resonance belonging to a particular frequency band and wherein the radiation emitting source comprises a radiation source that sweeps over the particular frequency band.

45. (Original) The radiation source of claim 44 wherein each of the radiation scatterers is electronically controllable.

46. (Original) The radiation source claim 45 wherein each of the radiation scatterers is controllable by a time-varying modulation signal.

47. (Currently Amended) The radiation source of claim 46 wherein said radiation scatterers are assigned into sets and wherein each radiation scatterer within a set of radiation scatterers is modulated in the same manner.

48. (Original) The radiation source of claim 44 wherein the radiation scatterers can be independently controlled by physically moving the point scatterers with respect to a reference plane.

49. (Original) The radiation source of claim 44 wherein each radiation scatterer comprises a conductive structure loaded by an impedance.

50. (Canceled)

51. (Original) The radiation source of claim 44 wherein the at least one radiation emitting source is arranged to illuminate the diffuser with radiation having a wavelength between about 0.1mm to about 10mm.

52. (Original) A millimeter wave system comprising:

a source of radiation, the radiation comprising a set of independently controllable radiation components, each radiation component comprising a doublet that includes two spectral lines, and each radiation component being labeled by a given frequency shift between the two spectral lines;

a receiver including an array of receiver elements disposed to receive the radiation emitted by the source, the receiver transforming the received radiation into an array of electrical signals; and

a processing system coupled to receive the array of electrical signals and for decoding the array of electrical signals based on the labels of the radiation components.

53. (Original) The system of claim 52 wherein the processing system is coupled to the source of radiation to provide instructions on how to control the radiation components.

54. (Original) The system of claim 52 wherein the frequency difference between the two spectral lines is modulated.

55. (Original) The system of claim 52 wherein the central frequency of the two spectral lines is swept in time.

56. (Original) The system of claim 52 wherein the two spectral lines comprise a co-polarized doublet and wherein the source of radiation comprises:

a pair of voltage controlled oscillators operating at a s-mmw frequency and having a first characteristic polarization state;

a set of load-modulated point scatterers that are illuminated by the voltage controlled oscillators, the set of load-modulated point scatterers being preferentially sensitive to the first characteristic polarization state;

wherein the load of each point scatterer is modulated with a time varying signal; and

wherein the scattered radiation is directed to an object being imaged.

57. (Original) The system of claim 52 wherein the source of radiation is in a substrate configuration, the source further comprising means to combine the radiation of the two spectral lines of each component.

58. (Original) The system of claim 52 wherein the source of radiation is in a waveguide configuration, the source further comprising means to combine the radiation of the two spectral lines of each component.

59. (Currently Amended) A method for creating radiation that includes a polarized doublet, the method including:

emitting radiation at a first s-mmw frequency;

emitting radiation at a second s-mmw frequency, wherein the difference between the first s-mmw frequency and the second s-mmw frequency is much smaller than the average of the first s-mmw frequency and the second s-mmw frequency;

<u>controlling the difference between the first s-mmw frequency and the second s-mmw frequency;</u>

polarizing the radiation at the first s-mmw frequency into a first characteristic polarization;

polarizing the radiation at the s-mmw frequency into a second characteristic polarization; ~~and~~

combining the radiation at the first s-mmw frequency and the radiation at the second s-mmw frequency; and

directing the combined radiation to a destination.

60. (Original) The method of claim 59 wherein the first polarization is essentially equal to the second polarization.

61. (Original) The method of claim 59 wherein the first polarization is essentially orthogonal to the second polarization.

62. (Canceled).

63. (Original) The method of claim 62 wherein the combined radiation is divided into two unequal parts, a major part being directed to the destination and a minor part being used to control the difference frequency.

64. (Original) The method of claim 59 and further comprising changing average of the first s-mmw frequency and the second s-mmw frequency.

65. (Original) The method of claim 59 and further comprising modulating the difference between the first s-mmw frequency and the second s-mmw frequency.

66. (Original) The method of claim 59 wherein the method is performed in a waveguide configuration.

67. (Original) The method of claim 59 wherein the method is performed in a planar substrate configuration.

68. (Original) A method of creating radiation that includes a cross-polarized doublet, the method comprising:

providing a voltage controlled oscillator operating at a first s-mmw frequency;

directing energy of the oscillator to uniformly illuminate first and second sets of load-modulated point scatterers, the first set exhibiting a first polarization state and the second set exhibiting a second polarization state, wherein the first polarization state is orthogonal to the second polarization state;

polarizing the oscillator in a third characteristic polarization state;

positioning the first and second sets of point scatterers such that the first and second polarization state substantially differs from the third characteristic polarization state;

modulating the load of the first scatterer with a first time varying signal;

modulating the load of the second scatterer with a second time varying signal, wherein the ground harmonic of first time varying signal essentially differs from any harmonic of the second harmonic time varying signal; and

scattering radiation from the first and second sets of point scatterers.

69. (Original) The method of claim 68 wherein the first and second time varying signals are periodic signals.

70. (Original) The method of claim 69 wherein the sum of the ground harmonics of the first periodic signal and the second periodic signal is equal to a doublet frequency difference.

71. (Original) The method of claim 69 wherein the difference of the ground harmonics of the first periodic signal and the second periodic signal is equal to a doublet frequency difference.

72. (Original) The method of claim 69 wherein the periodic signals are binary signals.

73. (Original) The method of claim 69 wherein the periodic signals are harmonic signals.

74. (Original) The method of claim 69 and further comprising controlling the difference frequency between the periodic signals by dividing the energy of both periodic signals in unequal parts, a major part being used to drive first and second loads and the minor part being used to control the difference frequency.

75-82 (Canceled)

83. (Original) A millimeter wave transmitter-receiver apparatus for transmitting and receiving image or communication data comprising:

a source of radiation, the radiation comprising a set of independently controllable radiation components, each radiation component comprising a doublet that includes two

spectral lines, and each radiation component being labeled by a given frequency shift between the two spectral lines;

a receiver including an array of receiver elements disposed to receive the radiation emitted by the source, the receiver transforming the received radiation into an array of electrical signals; and

a processing system coupled to receive the array of electrical signals and for decoding the array of electrical signals based on the labels of the radiation components.

84. (Currently Amended) The system of claim ~~82~~ 83 wherein the processing system is coupled to the source of radiation to provide instructions on how to control the radiation components.

85. (Currently Amended) The system of claim ~~82~~ 83 wherein the frequency difference between the two spectral lines is modulated.

86. (Currently Amended) The system of claim ~~82~~ 83 wherein the central frequency of the two spectral lines is swept in time.

87. (Currently Amended) The system of claim ~~82~~ 83 wherein the two spectral lines comprise a doublet and wherein the source of radiation comprises:

at least one pair of voltage controlled oscillators operating at different s-mmw frequencies;

a plurality of paired couplers each of which is individually coupled to an output of one of the voltage-controlled oscillators (VCOs) for dividing VCO radiation into a major portion for transmitting in free space and a minor portion for mixing;

a first mixer for mixing the minor radiation portion the VCO radiation to produce a first beat signal;

a phase locked loop (PLL) circuit providing phase-locking of the first beat signal by the reference signal, wherein one input of the PLL circuit is supplied by the first beat signal, another PLL circuit input is supplied by the ~~the~~ reference signal and an output correction voltage

produced by the PLL circuits is provided to a frequency correcting driving voltage input of one of the VCOs; and

an antenna system to transmit the major radiation portions produced by the VCOs in free space.

88. (New) The system of claim 11 wherein the spatially distributed point scatterers are disposed on a corrugated substrate.

89. (New) The system of claim 11 wherein each of the point scatterers change the phase of scattered radiation independently of others of the point scatterers.

90. (New) The system of claim 11 wherein each of the point scatterers change the frequency distribution of scattered radiation independently of others of the point scatterers.

91. (New) The system of claim 15 wherein magnitudes of the impedances of the loaded structures are time-varied due to modulation.

92. (New) The system of claim 91 wherein spatially distinct scatterers are modulated by signals exhibiting distinct modulation features.

93. (New) The system of claim 92 wherein one of the distinct modulation features is the frequency of the modulation signals.

94. (New) The system of claim 91 wherein the point scatterers are divided into sets and wherein each point scatterer within a set of point scatters is modulated with by the same modulation signal.

95. (New) The system of claim 94 and further comprising a processor coupled to receive the electrical signals from the receiver, the processor determining information related to the angle between a set of point scatterers and a point within the field of view.

96. (New) The system of claim 94 wherein each set of point scatterers is frequency modulated by a unique modulating signal, wherein the frequencies of the modulation signals partially overlap one another.

97. (New) The system of claim 94 wherein each set of point scatterers is frequency modulated by a unique modulating signal, wherein the frequencies of the modulation signals are distinct and narrowly ranging.

98. (New) The system of claim 94 wherein the composition each set of point scatterers can be dynamically changed.

99. (New) The system of claim 15 wherein the conductive structures comprise antennae.

100. (New) An s-mmw imaging system, comprising:

a non-rotating diffuser destroying a spatial coherence of radiation incident on the diffuser and directing the radiation towards a field of view, wherein the radiation incident on the diffuser includes doublet spectral components and wherein the radiation incident on the diffuser is modulated by modulating a spectral shift between doublet spectral components;

at least one radiation source disposed to illuminate the diffuser, the at least one radiation source generating radiation having a wavelength between about 0.1mm and about 10mm;

a quasi-optical element disposed between the field of view and a multi-element receiver, the quasi-optical element directly radiation from the field of view toward an imaging plane; and

a multi-element receiver disposed in the imaging plane, wherein particular ones of the receiver elements transform radiation into a set of electrical signals.

101. (New) The system of claim 13 wherein the diffuser comprises a two-dimensional array of point scatterers, each of the point scatterers having a position and orientation which can be independently changed in time relative to a reference plane.

102. (New) The system of claim 13 wherein the point scatterers comprise conductive structures being loaded by impedances.

103. (New) The system of claim 100 and further comprising a processor coupled to receive the electrical signals from the receiver, the processor generating resultant images from the electrical signals.

104. (New) The system of claim 100 wherein the radiation directed from the diffuser toward the field of view comprises a set of multiple phase-independent partials being independently controllable and exhibiting distinct physical features and wherein the electrical signals include information relating to features of the partials.

105. (New) The radiation source of claim 44 wherein the radiation scatterers are disposed on a corrugated substrate.

106. (New) The radiation source of claim 44 wherein the radiation scatterers have polarization selective characteristics.

107. (New) The radiation source of claim 44 wherein the point scatterers have frequency selective characteristics.

108. (New) The radiation source of claim 46 wherein the modulation signal exhibits distinct modulation features for distinct scatterers.

109. (New) The radiation source of claim 46 wherein the radiation scatterers are controlled by frequency-modulated modulation signals.

110. (New) The radiation source of claim 109 wherein the modulation frequency of the modulation signals is randomly distributed over the point scatterers of the diffuser and the frequency spread of the modulation frequencies is narrow band.

111. (New) The radiation source of claim 47 wherein the sets are assigned according to an angle of incidence of radiation scattered by the diffuser.

112. (New) The radiation source of claim 111 wherein the sets are dynamically assigned.

113. (New) The radiation source of claim 48 wherein each radiation scatterer is under piezoelectric control.

114. (New) The radiation source of claim 48 wherein each radiation scatterer is under electromagnetic control.

115. (New) The radiation source of claim 44 wherein each radiation scatterer is controlled by an electric signal.

116. (New) The radiation source of claim 44 wherein each radiation scatterer is controlled by an optical signal.

117. (New) The radiation source of claim 49 wherein each radiation scatterer includes a non-linear element.

118. (New) The radiation source of claim 49 wherein each radiation scatterer includes a resistive element.

119. (New) The radiation source of claim 49 wherein each radiation scatterer includes an inductive element.

120. (New) The radiation source of claim 49 wherein each radiation scatterer includes a capacitive element.

122. (New) The radiation source of claim 44 wherein the frequency resonances of the radiation scatterers are randomly distributed over the diffuser array.

123. (New) The radiation source of claim 50 wherein the radiation scatterers comprise antennas with closely spaced frequency resonances that are spatially clustered in given geometrical profiles.

124. (New) The system of claim 52 wherein the two spectral lines have co-polarization characteristics.

125. (New) The system of claim 52 wherein the two spectral lines have cross-polarization characteristics.

126. (New) The system of claim 52 wherein the receiver elements comprise mixers which generate difference frequency signals for the radiation components.

127. (New) The system of claim 52 wherein the source of radiation includes:

a first voltage controlled oscillator operating at a first frequency;

a second voltage controlled oscillator operating at a second frequency; and

an embedded mixer;

wherein the combined energy of the first and second voltage controlled oscillators is divided into two unequal parts, a major part being used to direct to the destination and a minor part being used to control a difference frequency between the two spectral lines by mixing the minor part in the embedded mixer.

128. (New) The system of claim 52 wherein the two spectral lines comprise a cross-polarized doublet and wherein the source of radiation includes:

a first set of load-modulated point scatterers, the first set exhibiting a second polarization state;

a second set of load-modulated point scatterers, the second set exhibiting a second polarization state, the first polarization state being orthogonal to the second polarization state; and

a voltage controlled oscillator operating at an s-mmw frequency having a third characteristic polarization state which differs from the said first and second characteristic polarization states, the voltage controlled oscillator illuminating the first and second sets of load-modulated point scatterers.

129. (New) The system of claim 56 wherein the time varying signal is a periodic signal.

130. (New) The system of claim 129 wherein the periodic signal has a ground harmonic frequency equal to half of the frequency difference between the two spectral lines.